REMARKS

Applicant respectfully requests reconsideration of the above application. Upon entry of the amendment herein, claims 1, 3, and 5-18 remain pending in the instant application.

Oath/Declaration

It has been stated that the Declaration filed in conjunction with the present application is unclear as to whether priority is claimed to U.S. Provisional Application Serial No. 60/119,771, since the Declaration contains the statement "N/A" adjacent the paragraph regarding domestic priority based on provisional applications under 35 U.S.C. §119. Applicant hereby affirmatively states that the present application claims priority under 35 U.S.C. §119 to Provisional Application Serial No. 60/119,771.

Drawings

The drawings filed herewith have been deemed to be informal and have been accepted for examination purposes only. Applicant respectfully submits that formal drawings will be provided, if appropriate, after allowance of the present application.

Objections

The specification has been objected to for various informalities. Applicant respectfully urges that this objection is made moot by the amendment of the specification herein. Therefore, Applicant respectfully requests withdrawal of this basis of objection.

Rejection of claim 18 under 35 U.S.C. §112 first paragraph

Claim 18 has been rejected under 35 U.S.C. §112, first paragraph as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant respectfully urges that this rejection is made moot by the amendment of the specification herein. Applicant respectfully submits that the specification has been amended to be internally consistent to reflect a temperature range of between about 200°C and 1600°C. Applicant respectfully traverses the statement that, "only temperatures in the range of about 300°C to 1600°C are enabled by the applicant's specification." Applicant submits that, as originally filed, the specification, including the claims, provided an enabling disclosure of at least the temperature range of about 200°C to about 1600°C. The amendment of the specification has been conducted simply to provide consistency therethrough. Consequently, Applicant respectfully requests withdrawal of this basis of rejection.

Rejection of claims 4, 5, 11 and 17 under 35 U.S.C. §112 second paragraph

Claims 4, 5, 11 and 17 have been rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully urges that this basis of rejection is made moot by the cancellation of claim 4 and the amendment of claims 5, 11 and 17 herein. Applicant reserves the right to pursue claim 4 or a similar claim in another application. In view of this amendment, Applicant respectfully requests withdrawal of this basis of rejection.

Rejection of claims 1, 2, 4-7 and 9-12 under 35 U.S.C. §102(b)

Claims 1, 2, 4-7 and 9-12 have been rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Patent No. JP 05-247651A to Idemitsu Petrochem Company ("Idemitsu"). Applicant respectfully submits that the complete scope and teachings of the Idemitsu reference cannot be determined at this point in time since the reference is in Japanese and the English translation that has been provided includes only the Abstract. While the rejection has referred to many specific sections of this Japanese patent, no details of these sections have been provided. Rather, the rejection includes only recitation of the rejected claim or claim element followed by a statement that Idemitsu teaches that claimed invention or element as verified through an oral translation. Such a recitation does not provide the context of the particular recited section nor a verification as to what is actually provided within the reference. Therefore, Applicant submits that it is impossible to analyze the cited reference sections or the references as a whole in order to determine whether this reference provides an enabling disclosure under 35 U.S.C. §112 as is required of a reference cited in support of a claim rejection.

Nevertheless, Applicant respectfully urges that this rejection is made moot by the amendment of claim 1 herein. As amended, claim 1 includes introducing a liquid precursor containing methanol into the reaction chamber. Based upon the translated abstract and the contents of the office action, it appears that Idemitsu requires that a gaseous component, such as hydrogen gas, be introduced in the introduction of the precursor. Applicant thus points out that Idemitsu appears to teach a different method and system than is recited by claims 1, 5-7 and 9-12, which method does not appear to disclose each and every limitation recited by the claims as is required for a finding of anticipation. It is therefore submitted that claim 1 is not anticipated by

the Idemitsu reference. Furthermore, Applicant respectfully urges that the rejection is also made moot as to claims 2 and 4, due to their cancellation herein without prejudice or disclaimer. Applicant reserves the right to pursue these or similar claims in another application. Additionally, in light of the fact that claims 5-7 and 9-12 depend from claim 1 and Idemitsu does not teach or suggest all of the limitations set forth in claim 1 as amended herein, Applicant respectfully urges that claims 5-7 and 9-12 are also not anticipated by Idemitsu. Therefore, Applicant respectfully requests withdrawal of this basis of rejection.

Rejection of claim 3 under 35 U.S.C. §103(a)

Claim 3 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Idemitsu. While the question of an enabling disclosure arises again in regards to this rejection of claim 3, Applicant, nonetheless, respectfully urges that this rejection is made moot by the amendment of claims 1 and 3 herein. Idemitsu appears not to teach nor suggest a liquid precursor introduced to the reaction chamber in such a manner as to avoid introduction of gaseous streams such as hydrogen. Conversely, Idemitsu adds gaseous hydrogen to the chamber. Consequently, the amount of methanol provided in a liquid precursor which avoids introduction of gas streams into the reaction chamber would not be obvious to one of ordinary skill in the art simply based on the teachings of Idemitsu. Thus, claim 3 is not obvious in light of Idemitsu. Consequently, Applicant respectfully requests withdrawal of this basis of rejection.

Rejection of claim 8 under 35 U.S.C. §103(a)

Claim 8 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Idemitsu in view of U.S. Patent No. 5,381,755 to Glesener et al. ("Glesener"). Further in view of the

foregoing statements, Applicant respectfully urges that this rejection is made moot by the amendment herein of claim 1, from which claim 8 depends. Glesener teaches the use of dopant only in a gas stream. Likewise, Idemitsu appears to provide only precursors with gas stream components to be introduced into a reaction chamber. Therefore, this combination of Idemitsu and Glesener does not teach nor suggest the use of a dopant in a liquid precursor that is introduced into a reaction chamber. Therefore, claim 8 is not obvious in view of the combination of Idemitsu and Glesener. Therefore, Applicant respectfully requests withdrawal of this basis of rejection.

Rejection of claim 13-18 under 35 U.S.C. §103(a)

Claims 13-18 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Idemitsu in view of U.S. Patent No. 5,225,275 to Aida ("Aida"). Applicant respectfully urges that this rejection is made moot by the amendment of claim 13 herein. Idemitsu and Aida both appear to disclose only gaseous precursor streams that are introduced into the apparatus in which the method is carried out. To the contrary, claim 13 provides for a liquid precursor to be introduced into the apparatus. Consequently, the combination of Idemitsu and Aida does not teach nor suggest all the limitations set forth in claim 13. Furthermore, since claims 14-18 depend from claim 13, Applicant respectfully urges that in view of the foregoing, claims 14-18 are also not made obvious by the combination of Idemitsu and Aida. Therefore, Applicant respectfully requests withdrawal of this basis of rejection.

CONCLUSION

Applicant respectfully urges that the present application is now in condition for allowance. Claims 1, 3, and 5-18 remain pending in the present application and are allowable as explained herein. If the Examiner believes that there are any unresolved issues, Applicant respectfully requests Examiner contact Applicant's attorney, Thomas B. McGurk, at 404-888-7462.

Respectfully submitted,

10/24/01
Date

Thomas B. McGurk
Registration No: 44,920
D. Scott Sudderth
Registration No: 34,026
Steven D. Kerr
Registration No: 32,472
Attorneys for Applicant

WOMBLE CARLYLE SANDRIDGE & RICE
P.O. Box 7037
Atlanta, GA 30357-0037
(404) 888-7462 (Telephone)
(404) 879-2994 (Facsimile)

Docket Number: A029 1080

Appendix

IN THE SPECIFICATION

On page 7, starting at line 17, please delete the paragraph and insert in place thereof the following:

The substrate generally is sheet or wafer of silicon, copper, aluminum and molybdenum. Some of the substrates are polished using 1 μm diamond paste prior to the deposition process. Typically, the substrate is mounted on a water cooled substrate holder. The substrate can be either in touch with the plasma or at a distance from the plasma. In experiments using the method of the present invention, the substrate was in touch with a microwave plasma ball generated inside a cylindrical microwave cavity. The reactor chamber pressure generally is maintained between 1 mtorr and 250 torr. The substrate of about 25mm x 25mm was heated by the plasma to about [300]200°C -1600°C. Diamond is deposited at a rate of 0.05-20 μm per hour depending on the composition of the solution, the vapor pressure, the substrate temperature, and the plasma power density.

On page 11, starting at line 14, please delete the paragraph and insert in place thereof the following:

When the precursor 5 comprises a solution of methanol and a proper quantity of one or more carbon containing compounds having a carbon to oxygen ratio greater than one, diamond growth is substantially uniform, reproducible, and at a higher growth rate than conventional CVD methods. For example, ethanol [(CH_3CH_3OH)] (CH_3CH_2OH), isopropanol, (($(CH_3)_2CHOH$), and acetone (CH_3COCH_3) have respective carbon to oxygen ratios of 2, 3, and [4] 3. The selection of the carbon containing compound is not limited to ethanol, isopropanol, or acetone, and may be

selected from other such carbon containing compounds having carbon to oxygen ratios greater than one. In addition, as indicated in Example 8 below, under certain CVD conditions, it is not required for the precursor 5 to contain methanol. However, if the precursor comprises only a carbon containing compound having carbon to oxygen ratios greater than one, suppression of the formation of non-diamond phases can generally be maintained by lowering the substrate temperature to below about 900° C and/or selectively [neucleate] nucleating the substrate with high quality diamond particles. Also, diamond growth is as well a function of the plasma density, reaction chamber pressure, carbon to oxygen ratio at the substrate surface, and precursor flow rate, and these functions must be monitored and adjusted accordingly to promote diamond growth. Further, if it is desired for the diamond to contain a dopant, the carbon containing compound can comprise [comprises] dopant elements or moieties in addition to C, O, and H, such as boron, phosphorus, silicon, etc. Such dopants include, but are not limited to, halides, metals, and the like. Still further, carrier gasses, such as argon, hydrogen, and the like may be utilized to increase the precursor flow rate into or through the reaction chamber 1.

On page 13, starting at line 16, please delete the paragraph and insert in place thereof the following:

In contrast to what was reported by *Buck*, who deposited clusters of diamond crystallites in a small area of 3-4 mm^2 in a methanol plasma, when methanol was used alone as the precursor feedstock for substrates of 25 mm x 25 mm in size or larger, only the area near the edge showed acceptable diamond nucleation density in some cases. The diamond deposition was highly non-uniform across the substrate surface. In other cases, too much oxidizing and carbon etching radicals were generated in the methanol plasma resulting in a very slow growth of diamond. For

example, when 2,000 W microwave was applied at a pressure of 80 torr and a substrate temperature of 900° C, the methanol plasma deposited only about 2 μm diamond on a molybdenum substrate after 40 hours of deposition. The diamond growth rate is only 0.05 μm per hour in this case. Using a solution comprising of methanol and one or more carbon containing compounds, that have a carbon to oxygen ratio being greater than one, diamond deposition rates of more than two orders of magnitude greater than some conventional methods have been achieved in the present invention.

On page 14, starting at line 14, please delete the paragraph and insert in place thereof the following.

Typical deposition parameters are as follows:

Microwave power	600-3000W
Vapor pressure	1 mtorr-250 torr
Substrate temperature	[300] 200° C-1600° C
Methanol	0.5-99.5% by weight
Ethanol, isopropanol, and acetone	0.5-99.5% by weight

IN THE CLAIMS

Please cancel claims 2 and 4 without prejudice or disclaimer.

Please amend claims 1, 3, 5, 8, 11, 13 and 17 as follows:

1. (Amended) A method of forming diamond crystals or a diamond film comprising:

disposing a substrate in a reaction chamber; [and]

introducing a liquid precursor containing methanol and at least one carbon containing compound having a carbon to oxygen ratio greater than one into an inlet of the reaction chamber;

vaporizing the liquid precursor; and

subjecting the vaporized precursor [comprising at least one carbon containing compound having a carbon to oxygen ratio greater than one] to a plasma under conditions effective to disassociate the vaporized precursor and promote diamond growth on the substrate.

3. (Amended) The method according to claim 1, wherein methanol is present in the liquid precursor in an amount between about 0.5 wt. % to about 99.5 wt. % of the liquid precursor.

5. (Amended) The method according to claim 1, wherein the [precursor] carbon containing compound is [a solution of methanol and a compound] selected from [the group comprising of] ethanol, isopropanol, acetone, and [the] combinations thereof.

8. (Amended) The method according to claim 1, wherein the carbon containing compound [further comprises] includes a dopant element or moiety.

11. (Amended) The method according to claim 10, wherein the electromagnetic energy has a frequency selected from the group [comprising] consisting of direct current, radio frequency, and microwave.

13. (Amended) A plasma enhanced chemical vapor deposition of diamond crystals and diamond films on surfaces of a substrate comprising:

providing an apparatus including an inlet, a disassociation zone, a deposition zone and an outlet;

introducing a liquid precursor comprising methanol and at least one carbon containing compound containing a carbon to oxygen ratio greater than one into the inlet under conditions effective to vaporize the liquid precursor, flow the vaporized precursor through the disassociation zone, and through the outlet;

disassociating and reacting the vaporized precursor as vaporized precursor flows or diffuses through the disassociation zone to produce OH, H, O, and carbon containing radicals; and

transporting the radicals to the substrate in the deposition zone to produce the diamond crystals or diamond films on the surface of the substrate.

17. (Amended) The process according to claim 16, further comprising:

selecting the supplementing compounds from the group [comprising] consisting of ethanol, isopropanol, acetone, and combinations thereof.